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**To:** Mr. Jeffry Rodin, On-Scene Coordinator, United States Environmental Protection Agency

**From:** Tom Campbell, P.E., Ecology and Environment, Inc.

**CC:** Steve Hall, START IV Removal Team Leader, Ecology and Environment, Inc.  
Jim Petersen, P.E., Ecology and Environment, Inc.

**Date:** August 12, 2015

**Re:** Final Bremerton Auto Wrecking Landfill - Gorst Creek Site Alternative 2 – Landfill Removal and Creek Restoration Preliminary Cost Estimate

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The United States Environmental Protection Agency (U.S. EPA) has tasked Ecology and Environment, Inc. (E & E), under Superfund Technical Assessment and Response Team (START) IV contract number EP-S7-13-07, technical direction document number 14-07-0001, to provide technical assistance for the Bremerton Auto Wrecking Landfill - Gorst Creek Site (the Site) located in Kitsap County, Washington (Figure 1).

This memorandum provides additional detail on the removal action cost estimate for the Site-wide comprehensive landfill removal alternative (Alternative #2) as presented in the Final Draft Engineering Evaluation and Cost Analysis (EE/CA) report for the Site (E & E 2012). Specifically, the cost estimate for Alternative #2 as presented in the Final Draft EE/CA dated April 2012 has been updated to include current rates and additional work necessary to meet fish passage criteria in the reestablished creek channel.

This memorandum is structured as follows:

Section 1.0	Introduction
Section 2.0	Costing Layout
Section 3.0	Capital Costs
Section 4.0	Indirect Costs
Section 5.0	Summary
Section 6.0	References
Figure 1	Site Location Map
Figure 2	Site Layout Map
Table A2.1	Preliminary Cost Estimate
Table A2.2	Derived Direct Capital Costs
Table A2.3	Markup Factors

## **1.0     INTRODUCTION**

The EE/CA was written to address the following removal action objectives at the Site:

- Provide sufficient hydraulic conveyance to prevent upstream surface water impoundment, thus preventing saturation of the landfill and potential for overtopping;
- Provide measures to appropriately cover waste at the landfill; and
- Provide measures to stabilize slopes and prevent further erosion.

The pipe by-pass alternative recommended in the EE/CA did not address fish passage along the upper reaches of Gorst Creek. The landfill removal alternative will meet removal objectives but is expected to require additional engineering design in order to provide functional habitat for native fish species to address comments from the Suquamish Tribe and the Washington Department of Fish and Wildlife. This may mean reestablishing the channel bottom as required to target species-related allowable velocities, selective placement of channel materials to form pools and riffles, additional on-Site coordination for material placement and type, and coordination among several agencies.

The removal action objectives are still current and have not been updated. They were developed for the 5.7-acre landfill centered along the Gorst Creek ravine (Figure 2). The ravine was 60 to 80 feet deep at this location before being used as a landfill. Gorst Creek is located in the ravine and is conveyed under the landfill through a culvert that was constructed when landfill operations began in 1968. Presently, the top of the landfill is nearly flush with the surrounding topography and much of the landfill surface is overgrown with vegetation and covered with debris. The pipe under the landfill is approximately 880 feet in length.

## **2.0     COSTING LAYOUT**

The cost estimate presented in the EE/CA was consistent with the “Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA” (U.S. EPA 1993) and “A Guide to Developing and Documenting Cost Estimates During the Feasibility Study” (U.S. EPA July 2000). As such, the cost estimates presented in the EE/CA provided an accuracy of +50 percent to -30 percent, which is consistent with feasibility stage estimates given that they are considered to be “order-of-magnitude.” The U.S. EPA’s 2000 guide to developing cost estimates states, “Removal action alternative cost estimates for the detailed analysis are intended to provide a measure of total resource costs over time (i.e., ‘life cycle costs’) associated with any given alternative.”

The updated cost estimate presented in this memorandum was developed using the following:

- Volume estimates presented in the EE/CA;
- R.S. Means Construction Cost Data (R.S. Means 2015);
- Past experience at this or similar sites; and
- Vendor quotes.

The National Oil and Hazardous Substances Contingency Plan states: “The types of costs that shall be assessed include the following: (1) Capital costs, including both direct and indirect costs; (2) Annual operations and maintenance costs; and (3) Net present value of capital and O&M costs” (40 Code of Federal Regulations 300.430 (e)(9)(iii)(G)).

Operations and maintenance (O&M) refers to the continued operation (inspections and upkeep) of the selected alternative on a yearly basis. Costs may include stormwater inspections, invasive plant eradication, and drainage maintenance. This alternative will result in complete removal of landfill material and restoration of the creek channel. O&M costs have not been included in this cost estimate.

The net present value of capital was not calculated since no O&M is included, and the cost estimate assumes that construction starts this year and does not account for a delayed starting period.

A summary of the updated cost estimate is provided in Table A2.1. Specific cost line items in the following capital and indirect costs sections are referred to by item number in the attached cost table.

### **3.0 ESTIMATED CAPITAL COSTS**

Estimated capital costs are discussed in the following sections:

- Section 3.1 Field Overhead and Oversight Costs
- Section 3.2 General Site Work Costs
- Section 3.3 Earthwork Costs
- Section 3.4 Disposal Costs

#### **3.1 Field Overhead and Oversight Costs**

Item C1a, Support Structure, includes office trailers, office equipment and supplies, storage facilities, decontamination facilities, temporary utilities, and Site security. It is assumed that either the Bremerton Auto Wrecking property or the Alpine property would be utilized for the field office, staging, and parking area for the duration of construction activities. Air monitoring equipment includes the cost for rental of a multi-gas monitor, three particulate monitors, a weather station, water quality instrumentation for site-wide monitoring, and four multi-gas monitors for personnel monitoring. Under a U.S. EPA-led removal action scenario, monitoring equipment may be available through the U.S. EPA and maintained and operated throughout construction by the START contractor.

The project’s duration was estimated at 9.8 months, using estimated production rates and crew sizes for the assumed critical path construction items. The estimated construction period does not include the time for design and permitting activities. An extended construction season was used in determining construction duration, which assumes that construction activities would have 1.5 days per month of inclement weather requiring work stoppage.

The EE/CA reported that records from 1981 through 2010 from Bremerton Station in Bremerton, Washington—the weather station closest to the Site—show a mean maximum temperature of 60.4 degrees Fahrenheit (°F) and a mean minimum temperature of 43.6 °F in the Gorst Creek area, with the coldest month observed in December. The mean annual precipitation from 1981 through 2010 was 56.37 inches. November and December receive the highest amount of precipitation, with averages of 9.39 and 10.07 inches, respectively. July and August are the driest months, with average precipitation amounts of 0.86 and 1.03 inches, respectively. The Gorst Creek area receives 5.33 inches of snowfall each year, with most of it falling in December and January (1.73 and 3.55 inches as an annual average, respectively). The construction estimate is based on working during the warmer and drier periods, with a 9.8-month construction period from January through October.

Based on an average of six working days per week, 24 working days per month, and a project duration of 9.8 months, the total number of working days after including work stoppage is estimated at approximately 236. Each working day is estimated to be 10 hours. Since overtime will be incurred, the labor cost estimates include a markup of 16.7%. This is based on R.S. Means reference table RO12909.90 for a crew working 6 days per week, 10 hours per day, with a payroll cost of 1.5 times normal wages.

The cost for Item C1b, Plans and Submittals, includes all submittals and implementation plans that make up the Construction Operations Plan and other plans such as an air monitoring plan, construction quality control plan, construction schedule, environmental protection plan which includes information on the storage of fuel and other chemicals for site use with associated spill prevention and reporting procedures, materials handling plan, site health and safety plan, site work plan, and stormwater pollution prevention plan. The costs in Plans and Submittals include the completion of analytical testing for waste disposal profiling and additional subsurface investigation to gather data for the project design phase.

Item C1c, Mobilization, includes mobilization and demobilization for trailers, storage boxes, large equipment and small equipment. Large equipment is assumed to be mobilized using a lowboy trailer for a 50-mile roundtrip delivery. Smaller equipment is either towed with a pickup truck or carried in the truck bed. The cost for temporary electric connection and disconnection is also included.

Item C1d, Travel, Lodging, and Per Diem, is based on 2015 fiscal year Federal Travel Rates for personnel lodging and per diem (GSA 2015). Per Diem costs were included for a construction crew of 10 workers and construction management consisting of a Site supervisor and clerk, which are the anticipated personnel if the U.S. EPA Emergency and Rapid Response Services contractor performs the work. No per diem cost was included for on-road truck drivers due to the availability of a local workforce for on-road drivers.

Additional crew may be necessary for waste sorting, removing tires/rims from autos, and removing excess dirt/debris from auto bodies. The current cost estimate includes laborers to be utilized during landfill material excavation and truck loading. Two laborers will be used for segregation of waste materials and spotting off-road trucks near each excavator, and one laborer will spot on-road trucks and inspect for overhanging material prior to shipment.

### **3.2 General Site Work Costs**

Item C2a, Clear and Grub Light Vegetation, is the cost for clearing the landfill surface, which consists of blackberry and smaller trees and bushes. The estimate uses 300 horsepower dozers for clearing. Excavators with 2-cubic-yard-capacity buckets were estimated to load 22-cubic-yard off-road trucks. The material will be stockpiled on Site and used as slash to cover the final slopes of the restored creek channel. Due to the difficulty of loading brush, 15% was added to the excavator cost.

Item C2b, Clear Heavy Vegetation, activities include vegetation clearing on areas of the Site not covered in C2a that have mature tree cover. These areas will be used for staging and segregating of waste prior to transport and storage of restoration materials. Again, all organic material is assumed to be segregated and incorporated in Site restoration. Some of the larger trees will be segregated for use as erosion control and habitat within the restored creek channel.

Item C2c, Land Surveying, includes the cost to survey the Site at 24 hours per survey. This cost is also assumed to cover laser level rental that can be used by the crew in the field to verify excavation depth.

Item C2d, Temporary Creek Diversion, is for routing Gorst Creek flows around the work area. Labor is included to refuel the pumps using one operator and one driver once per night for four nights per month. The assumed refueling time was estimated at two hours per trip. A hydrologic analysis for the Site determined the anticipated flow rates during peak storms that could potentially cause the overtopping of the landfill under existing conditions. These flows will be used as the basis of design for the pumping capacity requirement.

Items C2e through C2g cover best management practices (BMPs) that will be implemented for potential short-term cleanup-related impacts and post-construction control such as air emissions, erosion and sediment control, and noise levels, along with BMPs for achieving the U.S. EPA's Region 10 Clean and Green Policy. Specific BMPs would be determined during design.

Item C2e, Dust Control, is for light dust control estimated to entail a total of 10 days per month which may be incurred over several short periods of each day. Clearing and grubbing and earthwork are anticipated to require dust control. The estimate assumes an on-Site or nearby water source, and does not include an additional truck to deliver water from an off-Site source.

Item C2f, Haul Road Maintenance, is estimated at approximately two hours per day for a total estimated time of five days per month. Gravel will be purchased and brought to the Site.

The estimate for Item C2g, Erosion and Sediment Control, is considered the minimum quantity of erosion and sediment control products and materials required to protect stormwater discharging from the Site. The majority of these materials will be installed shortly before Site completion, before vegetation has been established. Design layout and calculations will determine how and where runoff from areas above the creek would be constructed. This estimate includes the cost for adding two riprap-lined channels. Additional costs have been included for monitoring of permanent vegetation establishment; final stabilization of the site is a

requirement in order to ensure that removal objectives are met. Permanent vegetative cover is anticipated to take three years during which time any remaining stormwater best management practice controls, such as silt fences, will be removed.

### **3.3 Earthwork Costs**

Item C3a, Landfill Excavation and Segregation, is the cost for removing all the landfill material in order to restore the creek channel. The landfill material would be removed with excavators starting at the downstream end of the culvert and working upstream. Progressing in this manner will allow the upstream end of the landfill to act as a dam and keep the work area dry. It will take approximately eight months to remove the landfill material. This progression of work will also result in the upstream end of the landfill beginning to be excavated near the beginning of the dry period, which occurs from July through September, and which will aid in keeping the working areas dry. Two laborers per excavator will be used for visual segregation of waste materials and spotting off-road trucks, and one laborer will spot for on-road trucks and inspect for overhanging material prior to shipment. Waste will be visually screened to remove, at a minimum, tires, construction waste, concrete, identifiable medical waste, municipal and general waste (non-hazardous), large metal objects including automobile waste (car bodies), and waste soil (contaminated but non-hazardous). The disposition of each of these waste types is listed under Section 3.4, Disposal Costs. Under this cost, the material is assumed to be loaded onto off-road trucks and dumped into stockpiles. Since the material is classified as landfill waste, a factor of 25% has been used to increase the cost of loading. The cost accounts for segregated stockpiles being loaded to on-road trucks to transport for disposal.

Slope Restoration is estimated under Item C3b. This cost is for placing cover soil over the Gorst Creek ravine slopes to support vegetation. No onsite source of cover soil is expected to exist under this alternative; therefore, material costs have been included. To protect the soil placed on the slopes, the cleared shrubs and trees will be placed as slash. The amount of slash was assumed to be 50 cubic yards per acre for light vegetation and 70 cubic yards for heavy vegetation areas. The volume of slash will be spread evenly across the final contours of the Site. Design layout and calculations will determine how and where runoff from areas above the creek will enter Gorst Creek. In order to accommodate runoff, a cost for adding an estimated two riprap-lined channels is included in this estimate under Item C2g.

Item C3c, Creek and Habitat Restoration, is the cost for restoring the creek channel and selective placement of log and rock weirs to create habitat pools and riffle areas. The EE/CA indicated that Coho salmon and coast-resident cutthroat trout occur or migrate in Gorst Creek; however, targeted species will be based on stakeholder input. Exact specifications for channel restoration and habitat creation will, at a minimum, be based on targeted species and geotechnical stability factors. The banks within the high water flow line will be vegetated, with a cost for sprig planting utilized for this estimate. The naturally occurring sand and gravels at the Site would be retained on the bottom of the channel, below the anticipated high water flow line, to the extent possible. A portion of the trees that would be removed as part of clearing activities would be placed around the creek bends and serve as erosion control. Bendway weirs and other flow-altering features would be constructed to minimize erosion. Other long-term erosion protection measures may include plantings, erosion control fabric, seeding, and mulch.

### **3.4     Disposal Costs**

Disposal Costs (Items C4a through C4f) include transportation and disposal costs for the anticipated waste materials from the Site. The total quantity of waste in the landfill has been estimated based on historical information and current site topography. Quantities of specific waste types within the landfill are unknown. For the purpose of this estimate, the following quantities were assumed: approximately 46,875 tons of municipal and general waste (non-hazardous); 7,500 tons of automobile waste (car bodies); 37,500 tons of waste soil (contaminated but non-hazardous); 100,000 tons of construction waste that includes asbestos-containing material; 100,000 tires; and approximately 18,538 tons of soil contaminated with lead and other heavy metals. Automobile wreckage without tires currently has an approximately \$50 per ton salvage/scrap value, as quoted by Navy Metals in Gorst, Washington. Salvageable scrap metal may offset a portion of the overall project cost.

Waste disposal and transportation costs were derived from a pricing estimate provided by Waste Management Corporation (WM). The WM estimate included disposal costs, fees, taxes, and hauling costs for the various waste types to appropriate disposal facilities. Municipal and general waste, non-hazardous waste soil, and construction waste would be hauled by truck to the Greater Wenatchee Regional Landfill and/or the Hillsboro Landfill. Soil contaminated with lead, chromium, and other heavy metals would be hauled by truck for stabilization and disposal at Chemical Waste Landfill of the Northwest, a RCRA Subtitle C landfill in Arlington, Oregon. A vender was identified that will accept waste tires and automobile wheels for a flat per-tire fee that includes drop-box service.

### **4.0     INDIRECT COSTS**

Contractor markups such as overhead and profit are included in the presented cost elements, rather than listed separately. Contingency is added as a percentage to the total cost of capital, and indirect activities and professional/technical services costs are added as a percentage of total capital cost. Professional/technical services are broken down by access/planning/institutional controls, project management, removal design, and construction oversight. Access, planning, and institutional control costs are those costs associated with planning the removal action with the adjacent property owners to coordinate access and include coordinating institutional controls with stakeholders following the removal action. Project management costs are home office management of field personnel, bidding and invoicing subcontracts, and securing bonds. Project management fees do not include the costs of planning documents, institutional controls, or third-party oversight which are captured under a separate line item as a percentage of total capital cost. Removal design costs are engineering fees for preparing the removal design and approving materials, shop drawings, submittals, record (as-built) drawings, and construction completion reporting. Project management costs include Emergency and Rapid Response Services (ERRS) contractor field personnel such as the foreman/field supervisor and clerk. Construction oversight includes costs for U.S. EPA oversight and U.S. EPA's START contractor oversight and monitoring costs.

## **5.0     SUMMARY**

The capital cost for Alternative 2 is summarized in Table A2.1. The direct capital costs and markup factors for Gorst, Washington, are presented in Tables A2.2 and A2.3, respectively.

O&M costs have not been included in this cost estimate. O&M refers to the continued operation (inspections and upkeep) of the selected alternative on a yearly basis. Costs may include invasive plant eradication and drainage maintenance common to any creek channel.

Since O&M costs were not included, the net present value of capital was not calculated. The cost estimate assumes that construction starts this year and does not account for a delayed starting period.

## **6.0     REFERENCES**

Ecology and Environment, Inc. (E & E), April 2012, Final Draft Engineering Evaluation/Cost Analysis, Bremerton Auto Wrecking Landfill - Gorst Creek Site, Port Orchard, Washington, TDD 10-08-0011, prepared for United States Environmental Protection Agency, Seattle, Washington.

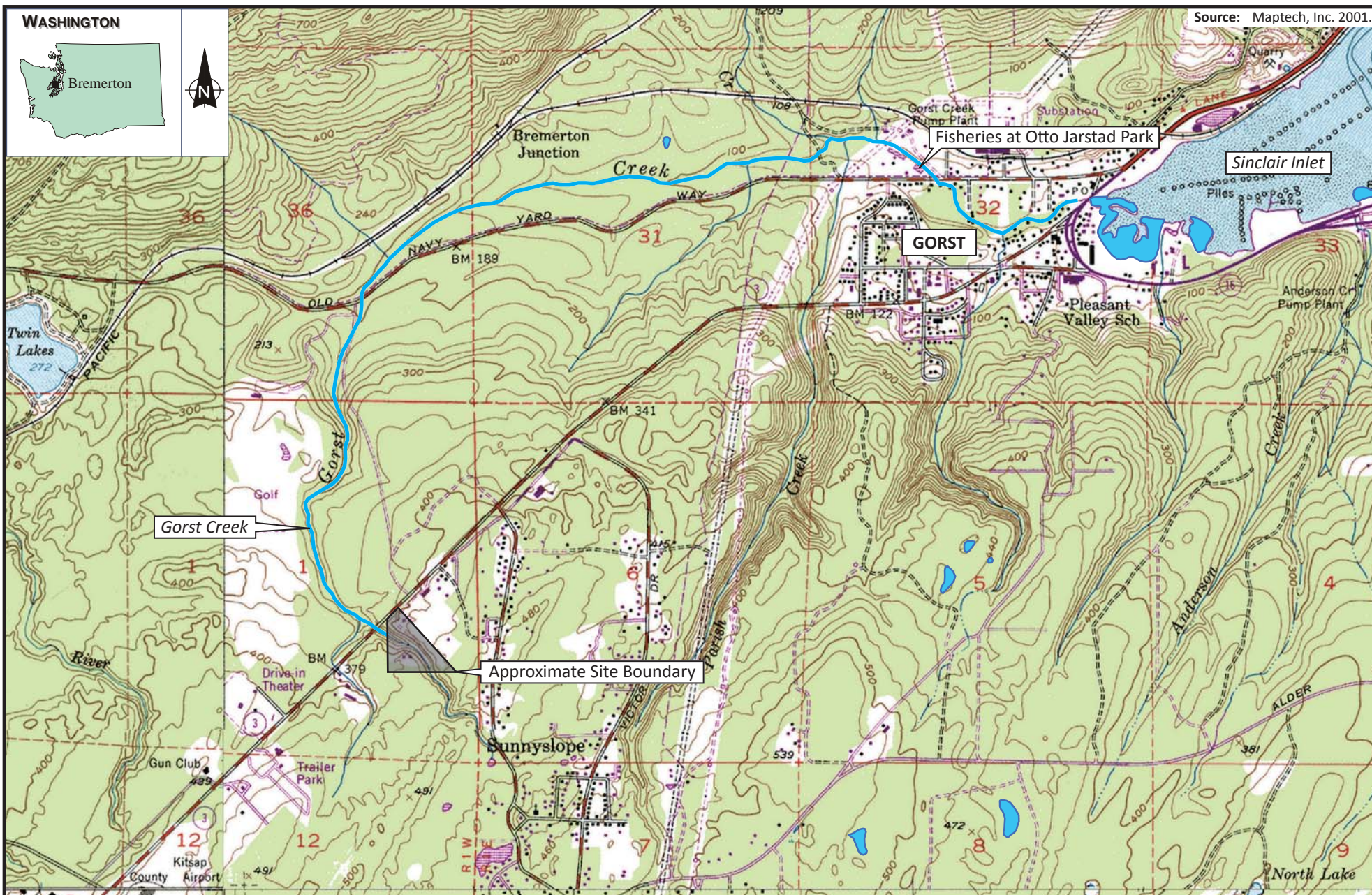
GSA (Government Services Administration), 2015. <http://www.gsa.gov/portal/category/100120>, accessed on March 6, 2015.

R.S. Means, 2015, Reed Construction Data Inc..

U.S. EPA (United States Environmental Protection Agency), August 1993. Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA (EPA 540-R-93-057)

\_\_\_\_\_, July 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study (EPA 540-R-00-002)





**ecology and environment, inc.**

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Seattle, Washington

# GORST CREEK LANDFILL Gorst, Washington

0 1000 2000  
Approximate Scale in Feet

Figure 1  
SITE LOCATION MAP

Date:  
3/27/15

Drawn by:  
AES

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**Table A2.1 ALTERNATIVE 2 - FINAL COST ESTIMATE**  
**Landfill Removal and Creek Channel Restoration**

Item	Description	Quantity	Unit	Cost/Unit	Cost
<b>Direct Capital Costs</b>					
<b>Field Overhead Costs:</b>					
C1a	Support Structure	9.8	Months	\$ 28,000	\$ 274,373
C1b	Plans and Submittals	1	Lump Sum	\$ 292,500	\$ 292,500
C1c	Mobilization/Demobilization	2	Occurrences	\$ 65,000	\$ 130,000
C1d	Travel, Lodging and Per Diem	9.8	Months	\$ 38,700	\$ 379,223
<b>Subtotal Field Overhead Costs</b>					<b>\$ 1,076,096</b>
<b>General Site Work Costs:</b>					
C2a	Clear and Grub Light Vegetation	10	Acres	\$ 2,460	\$ 24,600
C2b	Clear Heavy Vegetation	4.3	Acres	\$ 6,100	\$ 26,230
C2c	Land Surveying	6	Occurrences	\$ 9,300	\$ 55,800
C2d	Temporary Creek Diversion	1	Lump Sum	\$ 162,000	\$ 162,000
C2e	Dust Control	9.8	Months	\$ 12,546	\$ 123,000
C2f	Haul Road Maintenance	9.8	Months	\$ 26,793	\$ 262,600
C2g	Erosion and Sediment Control	900	Linear Feet	\$ 478	\$ 430,600
<b>Subtotal General Site Work Costs</b>					<b>\$ 1,084,830</b>
<b>Earthwork Costs:</b>					
C3a	Landfill Excavation and Segregation	150,000	Bank Cubic Yards	\$ 15	\$ 2,250,000
C3b	Slope Restoration	33,880	Bank Cubic Yards	\$ 53	\$ 1,795,700
C3c	Creek and Habitat Restoration	900	Linear Feet	\$ 172	\$ 154,800
<b>Subtotal Earthwork Costs</b>					<b>\$ 4,200,500</b>
<b>Disposal Costs</b>					
C4a	Municipal/general debris and waste	46,875	Tons	\$ 75.00	\$ 3,515,700
C4b	Auto body/steel	7,500	Tons	\$ (50)	\$ (375,000)
C4c	Waste soil from landfill	37,500	Tons	\$ 75.00	\$ 2,812,500
C4d	Construction waste (mixed with ACM)	100,000	Tons	\$ 75.00	\$ 7,500,000
C4e	Tires/rims	100,000	Each	\$ 3.70	\$ 370,000
C4f	Heavy metals contaminated waste	18,438	Tons	\$ 298.00	\$ 5,494,400
<b>Subtotal Disposal Costs</b>					<b>\$ 19,317,600</b>
<b>Total Direct Capital Costs (Rounded to Nearest \$1,000)</b>					<b>\$ 25,679,000</b>
<b>Indirect Capital Costs</b>					
I1a	Access/Planning/Institutional controls	1	Lump Sum	\$ 130,000	\$ 130,000
I1b	Project Management (ERRS)	9.8	Months	\$ 64,376	\$ 630,828
I1c	Removal Design (START)	1	Lump Sum	\$ 130,000	\$ 130,000
I1d	Construction Oversight (START/EPA/Monitoring)	9.8	Months	\$ 105,653	\$ 1,035,295
<b>Total Indirect Capital Costs (Rounded to Nearest \$1,000)</b>					<b>\$ 1,926,000</b>
<b>Subtotal Capital Costs</b>					<b>\$ 27,605,000</b>
<b>Total Capital Cost (Rounded to Nearest \$1,000)</b>					<b>\$ 27,605,000</b>
<b>Total Cost: Alternative 2 (Rounded to nearest \$10,000)</b>					<b>\$ 27,610,000</b>

Table A2.2

## Derived Direct Capital Costs for the Bremerton Auto Wrecking Landfill/Gorst Creek Site

## ITEM 1 FIELD OVERHEAD

## Derived Cost C1a - Support Structure

DESCRIPTION	QUANTITY	UNIT	MATERIAL	LABOR	EQUIPMENT	UNIT TOTAL	TOTAL	REFERENCE
Trailers - 2 units - 32 feet by 8 feet	2	Each	\$ -	\$ -	\$ 267.11	\$ 267.11	\$ 534	RSM 01 52 13.20 0350
Storage Boxes - 2 units	2	Each	\$ -	\$ -	\$ 92.20	\$ 92.20	\$ 184	RSM 01 52 13.20 1250
Field Office Lights/HVAC - Electric per trailer per month	2	Each	\$ 177.13	\$ -	\$ -	\$ 177.13	\$ 354	RSM 01 52 13.40 0160
Telephone/internet	1	Month	\$ 94.10	\$ -	\$ -	\$ 94.10	\$ 94	RSM 01 52 13.40 0140
Portable Toilet w/ sink cleaned weekly - 3 units	3	Month	\$ -	\$ -	\$ 157.00	\$ 157.00	\$ 471	Vendor Quote
Portable Eyewash Station - 2 units	2	Month	\$ -	\$ -	\$ 75.68	\$ 75.68	\$ 151	Vendor Quote
Field Office Equipment rental	1	Month	\$ -	\$ -	\$ 223.52	\$ 223.52	\$ 224	RSM 01 52 13.40 0100
Field Office Supplies	1	Month	\$ 88.57	\$ -	\$ -	\$ 88.57	\$ 89	RSM 01 52 13.40 0120
Trash pickup (Month)	1	Month	\$ 459.43	\$ -	\$ -	\$ 459.43	\$ 459	Engineering Estimate
Perimeter Air Monitoring Equipment Rental [1]	1	Month	\$ -	\$ -	\$ 5,113.02	\$ 5,113.02	\$ 5,100	Vendor Quote
Weather Station [2]	1	Month	\$ -	\$ -	\$ 983.49	\$ 983.49	\$ 1,000	Vendor Quote
Personnel Air Monitoring Equipment Rental [3]	1	Month	\$ -	\$ -	\$ 1,397.00	\$ 1,397.00	\$ 1,400	Vendor Quote
Water Quality Monitoring Equipment Rental [4]	1	Month	\$ -	\$ -	\$ 452.63	\$ 452.63	\$ 500	Vendor Quote
Rental truck 4WD (month) - 3 trucks	3	Each	\$ -	\$ -	\$ 737.62	\$ 737.62	\$ 2,213	RSM 01 54 33.40 7200
4WD truck fuel ( per week) x 3	12	Week	\$ 56.00	\$ -	\$ -	\$ 56.00	\$ 672	Engineering Estimate
Rental car (day) - 1 car	30	Day	\$ -	\$ -	\$ 44.70	\$ 44.70	\$ 1,341	Vendor Quote
Rental car fuel ( per week)	4	Week	\$ 24.55	\$ -	\$ -	\$ 24.55	\$ 98	Engineering Estimate
Security - Night Watchman (hours per month)	432	Hour	\$ -	\$ 30.36	\$ -	\$ 30.36	\$ 13,118	Engineering Estimate
<b>C1a Subtotal</b>							<b>\$ 28,000</b>	<b>per Month</b>

\* Job length is estimated for one construction period with working days based on estimated production rates and crew sizes of critical path components.

[1] 1 @ \$900/month Wireless MultiRAE Plus 11.7 eV, \$75/month calibration gas, and 3 @ \$1,200/month Wireless TSI DustTrak Aerosol Monitor (Field Environmental Instruments published quote) plus shipping.

[2] 1 @ \$765/month Wireless Met One Sonic Weather Station, \$85/month tripod, and \$30/month rain gauge mount (Field Environmental Instruments published quote) plus shipping.

[3] 1 @ \$1,250/month Wireless MultiRAE Pro Pumped 10.6 eV, 4 monitors per set (Field Environmental Instruments published quote) plus shipping.

[4] 1 @ \$255/month Lamotte Turbidity meter and \$150/month Oakton pH meter (Field Environmental Instruments published quote) plus shipping.

## Derived Cost C1b - Plans and Submittals [5]

DESCRIPTION	QUANTITY	UNIT	MATERIAL	LABOR	EQUIPMENT	UNIT TOTAL	TOTAL	REFERENCE
Site Management Plan	1	Lump Sum	\$ -	\$ -	\$ -	\$ 25,000	\$ 25,000	Engineering Estimate
Disposal Sampling Collection and Results	1	Lump Sum	\$ -	\$ -	\$ -	\$ 25,000	\$ 25,000	Engineering Estimate
Subsurface Investigation	1	Lump Sum	\$ -	\$ -	\$ -	\$ 150,000	\$ 150,000	Engineering Estimate
Community Relations Plan	1	Lump Sum	\$ -	\$ -	\$ -	\$ 10,000	\$ 10,000	Engineering Estimate
Construction Operations Plan [6]	1	Lump Sum	\$ -	\$ -	\$ -	\$ 25,000	\$ 25,000	Engineering Estimate
Quality Control Plan	1	Lump Sum	\$ -	\$ -	\$ -	\$ 15,000	\$ 15,000	Engineering Estimate
Safety Plan	1	Lump Sum	\$ -	\$ -	\$ -	\$ 5,000	\$ 5,000	Engineering Estimate
Traffic Control Plan	1	Lump Sum	\$ -	\$ -	\$ -	\$ 7,500	\$ 7,500	Engineering Estimate
Response Action Completion Report	1	Lump Sum	\$ -	\$ -	\$ -	\$ 30,000	\$ 30,000	Engineering Estimate
<b>C1b Subtotal</b>							<b>\$ 292,500</b>	<b>Lump Sum</b>

[5] Costs to produce planning documents only; the cost for obtaining permits and/or waivers, and set up institutional controls, is added as an indirect capital cost.

[6] The Construction Operations Plan includes information on operation of equipment, staging of materials, storage of fuel and chemicals for site use, and spill prevention and reporting procedures.

## Derived Cost C1c - Mobilization/Demobilization

DESCRIPTION	QUANTITY	UNIT	MATERIAL	LABOR	EQUIPMENT	UNIT TOTAL	TOTAL	REFERENCE
Mobe/Demobe of Trailers/Storage Boxes	8	Each	\$ 221.41	\$ -	\$ -	\$ 221.41	\$ 1,771	RSM 01 52 13.20 0890
Temporary Electric Connect/Disconnect	2	Each	\$ 793.55	\$ 2,500.04	\$ -	\$ 3,293.59	\$ 6,587	Engineering Estimate
Large Equipment Mobilization/Demobilization	16	Each	\$ -	\$ 2,277.37	\$ 1,173.48	\$ 3,450.85	\$ 55,200	RSM 01 54 36.50 0100
Small Equipment Mobilization/Demobilization	6	Each	\$ -	\$ 196.36	\$ 43.59	\$ 239.95	\$ 1,400	RSM 01 54 36.50 1100
<b>C1c Subtotal</b>							<b>\$ 65,000</b>	<b>per Occurrence</b>

## Derived Cost C1d - Travel, Lodging and Per Diem

DESCRIPTION	QUANTITY	UNIT	MATERIAL	LABOR	EQUIPMENT	UNIT TOTAL	TOTAL	REFERENCE
Monthly Lodging and Per Diem [7]	10	Each	\$ 3,870.00	\$ -	\$ -	\$ 3,870.00	\$ 38,700	CONUS rate, Port Orchard/Gorst, WA, \$129/day
<b>C1d Subtotal</b>							<b>\$ 38,700</b>	<b>per Month</b>

[7] Estimates assume an out of town crew including foreman/site supervisor and clerk.

Table A2.2

## Derived Direct Capital Costs for the Bremerton Auto Wrecking Landfill/Gorst Creek Site

## ITEM 2 GENERAL SITE WORK

## Derived Cost C2a - Clear and Grub Light Vegetation

DESCRIPTION	QUANTITY	UNIT	MATERIAL	LABOR	EQUIPMENT	UNIT TOTAL	TOTAL	REFERENCE
Clear and Grub Light Vegetation [8]	1	Acre	\$ -	\$ 951.43	\$ 1,033.78	\$ 1,985.21	\$ 1,985	RSM 31 13 13.10 0400
Load trees/brush to trucks, 2 CY capacity excavator, plus 15% for loading trucks	50	BCY	\$ -	\$ 1.26	\$ 1.14	\$ 2.40	\$ 120	RSM 31 23 16.42 0260+15%
Off-road truck, 22 cy, 10 MPH, 1 mile cycle, 20 minute wait/load/unload	70	LCY	\$ -	\$ 1.40	\$ 3.65	\$ 5.05	\$ 354	RSM 31 23 23.20 5360
<b>C2a Subtotal</b>							<b>\$ 2,460 per Acre</b>	

[8] Costs for light clearing of existing vegetation using a dozer with material retained for slash on final slopes.

## Derived Cost C2b -Clear Heavy Vegetation

DESCRIPTION	QUANTITY	UNIT	MATERIAL	LABOR	EQUIPMENT	UNIT TOTAL	TOTAL	REFERENCE
Tree Removal, 12 to 24 inch diameter, 15 foot spacing, 194 trees per acre [9]	1	Acre	\$ -	\$ 1,872.50	\$ 3,520.44	\$ 5,392.94	\$ 5,393	RSM 31 13 13.20 0340
Load trees/brush to trucks, 2 CY capacity excavator, plus 15% for loading trucks	70	BCY	\$ -	\$ 1.26	\$ 1.14	\$ 2.40	\$ 168	RSM 31 23 16.42 0260+15%
Off-road truck, 22 cy, 10 MPH, 1 mile cycle, 20 minute wait/load/unload	100	LCY	\$ -	\$ 1.40	\$ 3.65	\$ 5.05	\$ 505	RSM 31 23 23.20 5360
<b>C2b Subtotal</b>							<b>\$ 6,100 per Acre</b>	

[9] Some felled trees will be recovered and saved for erosion control in restored creek channel; other material will be retained for use as slash on final slopes.

## Derived Cost C2c - Land Surveying

DESCRIPTION	QUANTITY	UNIT	MATERIAL	LABOR	EQUIPMENT	UNIT TOTAL	TOTAL	REFERENCE
Land surveying, field	24	Hour	\$ -	\$ 200.00	\$ -	\$ 200.00	\$ 4,800	Engineering Estimate
Land surveying report	1	Lump Sum	\$ -	\$ 4,500.00	\$ -	\$ 4,500.00	\$ 4,500	Engineering Estimate
<b>C2c Subtotal</b>							<b>\$ 9,300 per Occurrence</b>	

## Derived Cost C2d - Temporary Creek Diversion [10]

DESCRIPTION	QUANTITY	UNIT	MATERIAL	LABOR	EQUIPMENT	UNIT TOTAL	TOTAL	REFERENCE
Sump Hole Construction	4000	CF	\$ 1.21	\$ 1.60	\$ 0.32	\$ 3.13	\$ 12,520	RSM 31 23 19.20 1600
12 inch diversion pipe	1200	LF	\$ 23.80	\$ 28.64	\$ 5.81	\$ 58.26	\$ 69,909	RSM 31 23 19.20 1700
Pump Rental	9.799045139	Month	\$ 6,005.84	\$ -	\$ -	\$ 6,005.84	\$ 58,852	01 54 33.70 1600
Attended 2 hours per evening, 4 times per month [11]	39	Each	\$ -	\$ 355.07	\$ 173.90	\$ 528.97	\$ 20,733	1 operator and 1 driver for 2 hours with pickup
<b>C2d Subtotal</b>							<b>\$ 162,000 Lump Sum</b>	

[10] Pump/discharge system will consist of a temporary diversion dam, pumps, and piping to allow the creekflow to be bypassed around the landfill.

[11] Labor is included for 4 nights per month where rainfall will require the pumps to be run overnight.

## Derived Cost C2e - Dust Control

DESCRIPTION	QUANTITY	UNIT	MATERIAL	LABOR	EQUIPMENT	UNIT TOTAL	TOTAL	REFERENCE
Dust control. Light	10	Day	\$ -	\$ 647.78	\$ 558.80	\$ 1,206.58	\$ 12,065.85	31 23 23.20 2500
Water	6,000	Gallon	\$ 0.08	\$ -	\$ -	\$ 0.08	\$ 480.00	Engineer Estimate
<b>C2e Subtotal</b>							<b>\$ 12,546 per Month</b>	

## Derived Cost C2f - Haul Road Maintenance

DESCRIPTION	QUANTITY	UNIT	MATERIAL	LABOR	EQUIPMENT	UNIT TOTAL	TOTAL	REFERENCE
Haul Road Maintenance	5	Day	\$ -	\$ 1,024.31	\$ 2,120.09	\$ 3,144.40	\$ 15,721.98	Using dozer and operator rates
Rock	333	LCY	\$ 33.21	\$ -	\$ -	\$ 33.21	\$ 11,070.68	Engineer Estimate
<b>C2f Subtotal</b>							<b>\$ 26,793 per Month</b>	

## Derived Cost C2g - Erosion and Sediment Control

DESCRIPTION	QUANTITY	UNIT	MATERIAL	LABOR	EQUIPMENT	UNIT TOTAL	TOTAL	REFERENCE
Riprap lined channels (post-construction)	2	LCY	\$ 33.21	\$ 23.28	\$ 12.74	\$ 69.23	\$ 138.46	RSM 31 37 13.10 0100
Silt Fence, Polypropylene, 3' High, Ideal Conditions	4	LF	\$ 0.80	\$ 1.54	\$ 0.15	\$ 2.48	\$ 9.92	RSM 31 25 14.16 1000
Jute Mesh, stapled, along bare slopes	45	SY	\$ 1.14	\$ 0.77	\$ 0.15	\$ 2.05	\$ 92.47	RSM 31 25 14.16 0300
Inspection and erosion repair prior to stabilization, cost per LF of channel	1	LF	\$ -	\$ 230.77	\$ -	\$ 230.77	\$ 230.77	Labor Rate from RSM 31 25 14.16 0300
Silt Fence removal	4	LF	\$ -	\$ 1.54	\$ 0.15	\$ 1.68	\$ 6.74	Adapted from RSM 31 25 14.16 1000
<b>C2g Subtotal</b>							<b>\$ 478 per Linear Foot</b>	

Table A2.2

## Derived Direct Capital Costs for the Bremerton Auto Wrecking Landfill/Gorst Creek Site

## ITEM 3 EARTHWORK

## Derived Cost C3a - Landfill Excavation and Segregation

DESCRIPTION	QUANTITY	UNIT	MATERIAL	LABOR	EQUIPMENT	UNIT TOTAL	TOTAL	REFERENCE
Excavate landfill material, 2 CY capacity excavator	1	BCY	\$ -	\$ 1.16	\$ 1.05	\$ 2.21	\$ 2.21	RSM 31 23 16.42 5300+25%
Off-road truck, 22 cy, 15 MPH, 2000 foot cycle, 15 minute wait/load/unload	1.5	LCY	\$ -	\$ 1.34	\$ 3.49	\$ 4.82	\$ 7.23	RSM 31 23 23.20 5430
Segregating waste tires/nonsuitable material and spotting truck loading/clearing material	0.001	BCY	\$ -	\$ 2,283.44	\$ -	\$ 2,283.44	\$ 1.95	one at each truck
Load staged material to trucks, 2 CY capacity excavator	1.5	LCY	\$ -	\$ 1.01	\$ 1.06	\$ 2.07	\$ 3.11	RSM 31 23 16.42 0260
<b>C3a Subtotal</b>							<b>\$ 15</b>	<b>per Bank Cubic Yard</b>

## Derived Cost C3b - Slope Restoration

DESCRIPTION	QUANTITY	UNIT	MATERIAL	LABOR	EQUIPMENT	UNIT TOTAL	TOTAL	REFERENCE
Load topsoil stockpiles to trucks, 2 CY capacity excavator, sandy loam	1	BCY	\$ -	\$ 0.93	\$ 0.84	\$ 1.77	\$ 1.77	RSM 31 23 16.42 5300
Topsoil (material)	1.3	LCY	\$ 24.00	\$ -	\$ -	\$ 24.00	\$ 31.20	Engineers Estimate
Off-road truck, 22 cy, 15 MPH, 2000 foot cycle, 15 minute wait/load/unload	1.3	LCY	\$ -	\$ 1.34	\$ 3.49	\$ 4.82	\$ 6.27	RSM 31 23 23.20 5360
Spread topsoil with dozer	1.3	LCY	\$ -	\$ 1.88	\$ 3.53	\$ 5.41	\$ 7.04	RSM 31 23 23.17 0190
Hydroseeding	0.0004	Acre	\$ 1,729.24	\$ 1,144.55	\$ 425.36	\$ 3,299.15	\$ 1.36	RSM 32 92 19.14 5400
Load trees/brush to trucks, 2 CY capacity excavator, plus 15% for loading trucks	0.016	BCY	\$ -	\$ 1.26	\$ 1.14	\$ 2.40	\$ 0.04	RSM 31 23 16.42 0260+15%
Off-road truck, 22 cy, 15 MPH, 2000 foot cycle, 15 minute wait/load/unload	0.016	BCY	\$ -	\$ 1.34	\$ 3.49	\$ 4.82	\$ 0.08	RSM 31 23 23.20 5360
Placement of slash with excavator	1	BCY	\$ -	\$ 1.86	\$ 2.92	\$ 4.78	\$ 4.78	and production factor of 450 SY per day.
<b>C3b Subtotal</b>							<b>\$ 53</b>	<b>per Bank Cubic Yard</b>

## Derived Cost C3c - Creek and Habitat Restoration

DESCRIPTION	QUANTITY	UNIT	MATERIAL	LABOR	EQUIPMENT	UNIT TOTAL	TOTAL	REFERENCE
Excavate channel, 1 CY/Linear foot of channel, load trucks +15%, CREW B12c	0.2	MSF	\$ -	\$ 150.64	\$ 41.74	\$ 192.39	\$ 38.48	daily rates and production factor of 1200 SF per day.
Machine place rock weirs, log weirs	0.2	Each	\$ -	\$ 88.06	\$ 15.53	\$ 103.59	\$ 20.72	31 37 13.10 0200
Import riprap, material delivered	0.5	Ton	\$ 39.00	\$ -	\$ -	\$ 39.00	\$ 19.50	Vendor Quote
Machine placed riprap, coverage=20 SF/Ton	1	LCY	\$ -	\$ 23.28	\$ 12.74	\$ 36.02	\$ 36.02	31 37 13.10 0100
Sprig planting, 12 inch on center by hand	0.50	MSF	\$ 14.23	\$ 101.22	\$ -	\$ 115.44	\$ 57.72	32 92 26.13 0160
<b>C3c Subtotal</b>							<b>\$ 172</b>	<b>per Linear Foot</b>

## References:

RSM is R.S. Means, 2015, Cost Data.

BCY = Bank (in-place) cubic yard

CF = Cubic feet

LCF = Loose cubic yard

LF = Linear feet

MSF = Thousand square feet

SY = Square yard

## Notes on Item 4, Disposal:

Municipal/general debris and waste was assumed at 0.625 tons/LCY.

Scrap values for the steel and autobodyes were quoted by Navy City Auto Recycling, Gorst, WA on 3/25/2015.

Waste soil from the landfill was assumed at 1.5 tons/LCY.

Construction waste (mixed with ACM) was assumed at 2 tons/LCY.

Tires w/rim disposal was obtained from quote by Tire Disposal &amp; Recycling, Inc. The price includes on-site dropbox service with pick-up.

**Table A2.3****Markup Factors for Tacoma, Washington**

Reference: R.S. Means Cost Data 2015 (RSM)

The majority of the work will be Excavation (as defined by RSMeans) by Equipment Operators, Laborers, and Foremen

**Labor<sup>1</sup>**

Category	Overtime % (6 days @ 10 hrs/day)	Workers Comp %	Fixed Overhead	Home Office Overhead	Profit	Tacoma, WA Installation Factor	40-hr Trained Personnel	Total Factor
Excavation	16.7%	5.53%	18.0%	14.0%	10%	8.4%	2.5%	2.0243

**Materials<sup>2</sup>**

Profit	Tacoma, WA Materials Factor	WA Sales Tax	Total Factor
10%	-5.5%	6.5%	1.1071

**Equipment<sup>3</sup>**

Profit	Tacoma, WA Equipment Factor	Total Factor
10%	1.6%	1.1176

<sup>1</sup> Labor factor is based on the Tacoma, WA city cost index for Site and Infrastructure, Demolition (RSM CCI).

Overtime is based on 6 days per week at 10 hours per day and payroll of 1-1/2 times normal hourly rate (RSMs RO12909-90).

Workers Comp % is based on Washington rates for Excavation (RSM RO131.6217WA-EXC).

Home Office and Fixed Overhead are national averages for Equipment Operators (RSM back cover)

<sup>2</sup> Materials factor is based on the Tacoma, WA city cost index for Site and Infrastructure, Demolition (RSM CCI).<sup>3</sup> Equipment factor is based on the Tacoma, WA city cost index for Contractor Equipment (RSM CCI).